

LESSON SUMMARY

CXC CSEC MATHEMATICS

UNIT SEVEN:
Geometry

Lesson

14

Constructing Shapes

Textbook: Mathematics, A Complete Course by Raymond Toolsie, Volume 1

(Some helpful exercises and page numbers are given throughout the lesson, e.g. Ex 9k page 476)

INTRODUCTION

The ability to construct geometric figures is an important skill in Mathematics that has applications in other areas. In this lesson we will look at constructing lines, angles and polygons.

OBJECTIVES

At the end of this lesson you will be able to:

- a) Use instruments to draw line segments.
- b) Use instruments to construct angles and polygons.

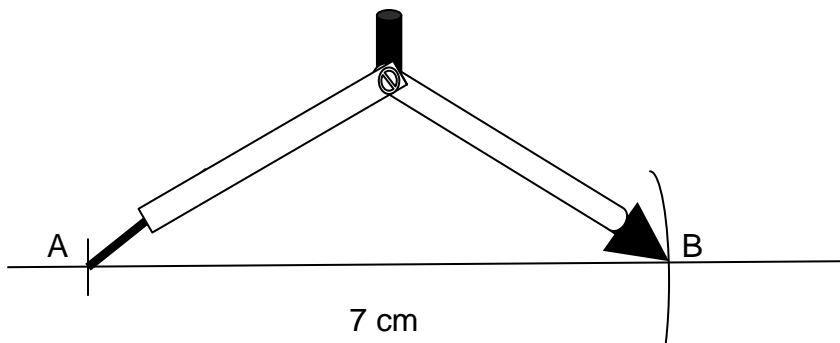


7.5 Construction

Constructing a line segment.

Example: Construct a line segment AB of length 7cm.

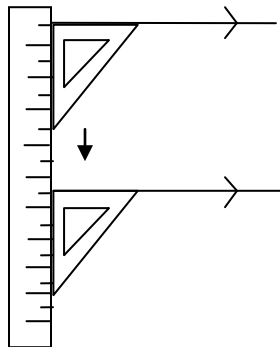
1. Using a ruler draw a line longer than 7 cm.
2. Open your compass to an opening of 7cm.
3. Place the metal point of the compass on a point on the line. Call this point A.
4. Rotate your compass to make an arc that cuts the line. The line segment between point A and the arc (call this point B) is 7 cm.



Drawing Parallel Lines

Example: Draw two parallel lines.

1. Arrange a ruler and a set square as shown in the diagram below.
2. Draw the first line using the set square as a guide.
3. Slide the set square down the ruler and draw the second line.





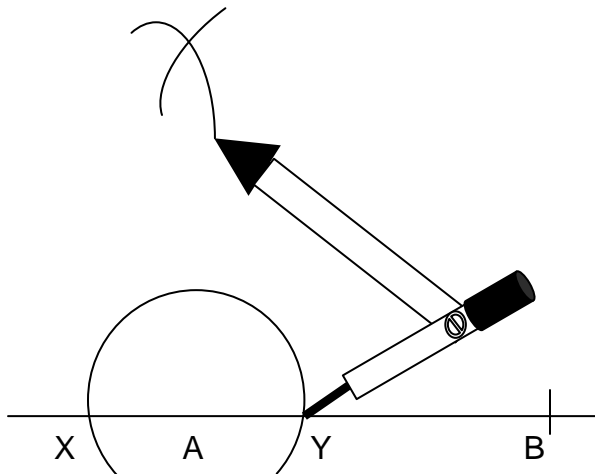
ACTIVITY 1

Construct a line segment RS of length 10.5 cm.

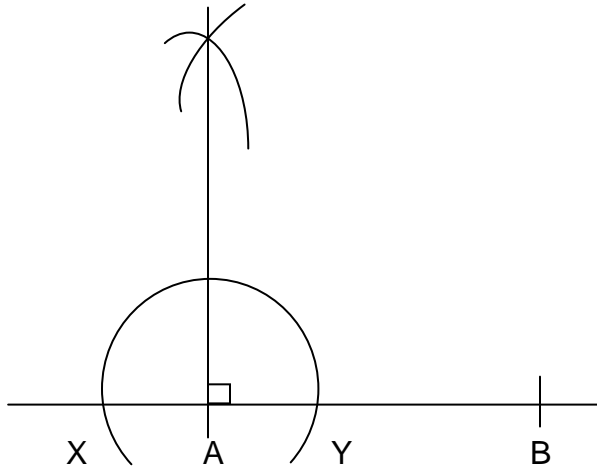
Constructing Angles

Example: construct an angle of magnitude 90° :

1. Draw a line segment AB.
2. Open your compass a bit using point A as the centre draw an arc to cut the line at X and at Y.
3. Open your compass more than half the distance of XY.
4. Using X as the centre, draw an arc above the line. Then using Y as the centre draw another arc to intersect the arc drawn previously.

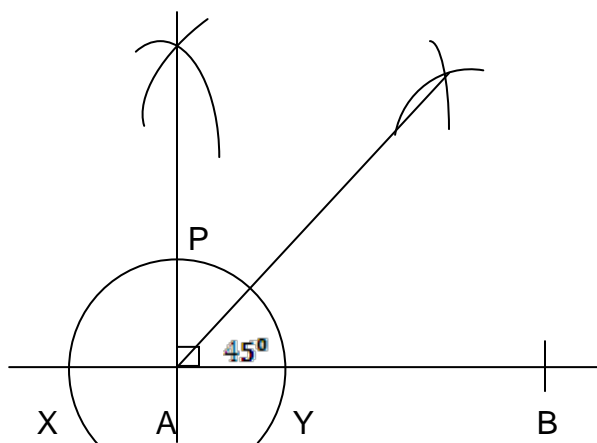


5. Draw a straight line from where the arcs meet passing through A. The angle formed is 90° .



To construct a 45° angle simply bisect the 90° angle.

1. With P and then Y as centre draw arcs to intersect.
2. Draw a line from this intersection to A. The angle formed is 45°





- i. Construct a 60° angle.
- ii. Bisect the 60° angle to construct a 30° angle. (see page 439)

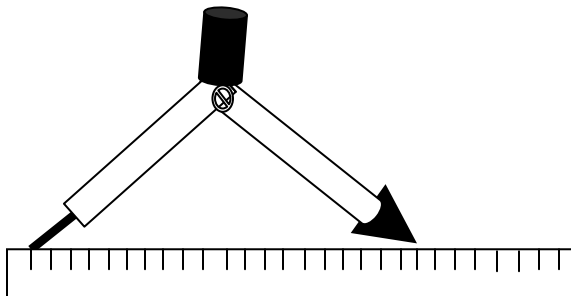
Constructing Polygons

Polygons with sides of given lengths and given angles can be constructed using a ruler, a compass and other instruments If needed.

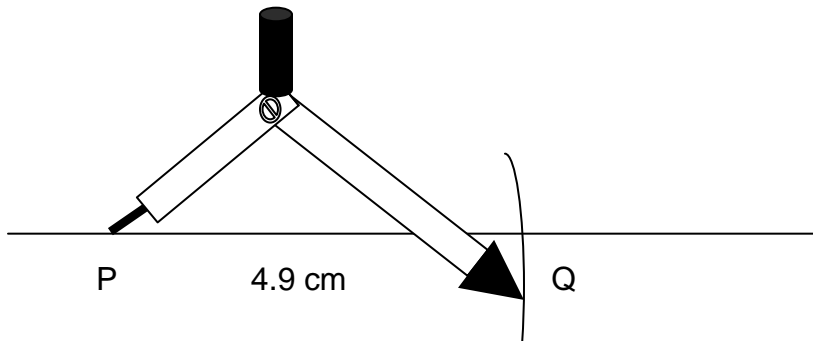
Example: Using ruler and compass only, construct the triangle PQR, with $PQ = 4.9$ cm, $QR = 3.6$ cm and angle $PQR = 120^\circ$. Show all construction lines clearly.

Solution:

1. Draw a line longer than 4.9 cm.
2. Locate a point P closer to the left end of the line.
3. Open your compass to a distance of 4.9 cm.

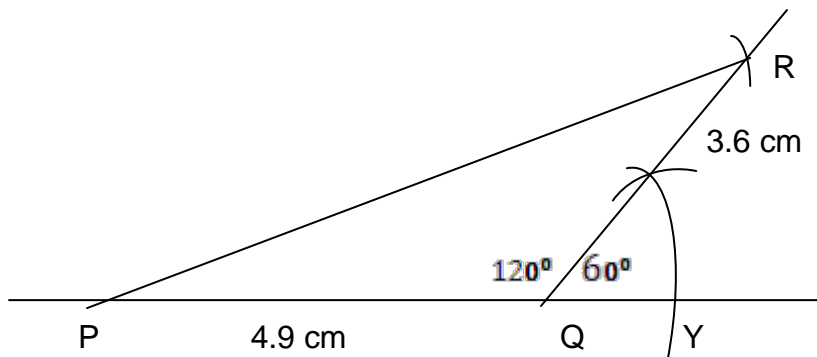


- Place the metal point of the compass on P and draw an arc to intersect the line at Q.



Now we have to construct a 60° angle to get the 120° angle on the other side.

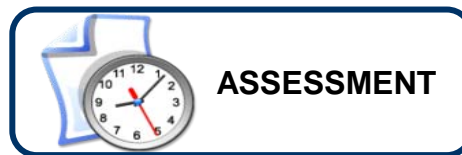
- Open the compass a little and with the metal point on Q draw an arc to intersect the line at Y.
- With Y as the centre and using the same opening of the compass draw another arc to intersect the arc that was drawn just before.
- Draw a straight line through the intersection of the arc and Q.



- With Q as centre open the compass to 3.6 cm and draw an arc to intersect the line at R.
- Draw a line from P to R to complete the triangle.



Using ruler and compasses only, construct the rectangle ABCD, with adjacent sides $AB = 8.5 \text{ cm}$ and $AD = 5.4 \text{ cm}$. show all construction lines clearly. (Ex 9k page 476)



CXC Question

Using ruler and compasses only:

- (i) Construct $\triangle ABD$ such that $BD = 7 \text{ cm}$, angle $ABD = \text{angle } ADB = 60^\circ$.
- (ii) Construct AX which is perpendicular to BD and which intersects BD at X .
- (iii) Complete the quadrilateral $ABCD$ such that $AC = 2AX$.
- (iv) Measure and write down the length of AC .
- (v) Name the type of quadrilateral you have drawn.

[All construction lines must be clearly shown.]

Conclusion

The basic idea of constructing any line or angle is the same. Therefore the procedures presented here can be used to construct other angles and polygons not dealt with specifically in this lesson.

